

Claims:

1. (Currently Amended) A heterojunction bipolar transistor (HBT), comprising:

successive emitter, base and collector layers,
an InP sub-collector layer, and
a thermally conductive InGaAs contact layer
between said collector and sub-collector layers,

said contact layer being thin enough to have a lateral conductivity inadequate for it to function by itself as a contact to the collector layer, but functioning as an electrical conductor between said collector and sub-collector layers.

2. (Original) The HBT of claim 1, said contact layer having a thickness not greater than about 500 Angstroms.

3. (Original) The HBT of claim 2, said contact having a thickness in the approximate range of 100-200 Angstroms.

4. (Original) The HBT of claim 1, wherein said contact and sub-collector layers extend lateral to said collector layer.

5. (Original) The HBT of claim 4, further comprising a contact pad on said contact layer lateral to said collector layer for establishing a contact to the collector layer through the contact and sub-collector layers.

6. (Original) The HBT of claim 1, wherein at least a portion of said sub-collector layer lateral to said collector layer is electrically insulative to electrically isolate said HBT.

⁼7. (Currently Amended) A heterojunction bipolar transistor The (HBT) of claim 6, comprising:

successive emitter, base and collector layers,
an InP sub-collector layer, and
 5 a thermally conductive InGaAs contact layer
between said collector and sub-collector layers,

wherein at least a portion of said sub-
collector layer lateral to said collector layer is
electrically insulative to electrically isolate said HBT,
 10 and said sub-collector layer extends laterally beyond
said contact layer and said insulative portion of the
sub-collector layer is lateral to said contact layer.

8. (Original) The HBT of claim 6, said insulative
 15 portion of the sub-collector layer including implanted
 ions and associated trapped conductors.

9. (Currently Amended) A double heterojunction
 bipolar transistor (DHBT), comprising;
 20 an InP or InAlAs emitter,
 an InGaAs base,
 an InP or InGaAs collector,
 an InP sub-collector, and
 an InGaAs contact layer between said collector
 25 and sub-collector which establishes, together with the
 sub-collector, a low resistance contact to the collector,
 said contact layer being thin enough to provide a
 substantially higher thermal conduction path between said
 collector and sub-collector than would bulk InGaAs, and
 30 to have a lateral conductivity inadequate for it to
function by itself as a contact to the collector.

10. (Original) The DHBT of claim 9, said contact layer having a thickness not greater than about 500 Angstroms.

5 11. (Original) The DHBT of claim 10, said contact layer having a thickness in the approximate range of 100-200 Angstroms.

10 12. (Original) The DHBT of claim 9, wherein said contact layer in doped N+.

13. (Original) The DHBT of claim 9, wherein said contact layer and sub-collector extend lateral to said collector.

15 14. (Original) The DHBT of claim 13, further comprising a contact pad on said contact layer lateral to said collector.

20 15. (Original) The DHBT of claim 13, wherein at least a portion of said sub-collector lateral to said collector is electrically insulative to electrically isolate said HBT.

25 16. (Currently Amended) A double heterojunction bipolar transistor The (DHBT) of claim 15, comprising:
an InP or InAlAs emitter,
an InGaAs base,
an InP or InGaAs collector,
30 an InP sub-collector, and
an InGaAs contact layer between said collector and sub-collector which establishes, together with the sub-collector, a low resistance contact to the collector, said contact layer being thin enough to provide a

substantially higher thermal conduction path between said collector and sub-collector than would bulk InGaAs,

wherein said contact layer and sub-collector extend lateral to said collector, at least a portion of said sub-collector lateral to said collector is electrically insulative to electrically isolate said HBT, said sub-collector extends laterally beyond said contact layer, and said insulative portion of the sub-collector is lateral to said contact layer.

10 17. (Original) The DHBT of claim 15, said insulative portion of the sub-collector including implanted ions and associated trapped conductors.

15 18. (Currently Amended) A heterojunction bipolar transistor (HBT), comprising:

successive emitter, base and collector layers, said emitter, base and collector layers being surrounded laterally by air gaps for lateral isolation, and

20 an InP sub-collector layer having an electrically insulative portion which laterally surrounds and electrically isolates the HBT.

25 19. (Original) The HBT of claim 18, wherein said sub-collector layer extends laterally beyond said collector layer, with said insulative portion located lateral to said collector layer.

30 20. (Original) The HBT of claim 18, wherein said insulative portion of the sub-collector layer includes implanted ions and associated trapped conductors.

21. (Original) The HBT of claim 18, wherein said ions have a more uniform than Gaussian distribution through the thickness of said sub-collector layer.

5 22-32. (Cancelled)

33. (Re-presented - formerly independent claim 1) A heterojunction bipolar transistor (HBT), comprising:

successive emitter, base and collector layers,

10 an InP sub-collector layer, and

2 a thermally conductive InGaAs contact layer between said collector and sub-collector layers.

34. (Re-presented - formerly dependent claim 2) The HBT of claim 33, said contact layer having a thickness not greater than about 500 Angstroms.

35. (Re-presented - formerly dependent claim 3) The HBT of claim 34, said contact having a thickness in the approximate range of 100-200 Angstroms.

36. (Re-presented - formerly dependent claim 4) The HBT of claim 33, wherein said contact and sub-collector layers extend lateral to said collector layer.

37. (Re-presented - formerly dependent claim 5) The HBT of claim 36, further comprising a contact pad on said contact layer lateral to said collector layer for establishing a contact to the collector layer through the contact and sub-collector layers.

38. (Re-presented - formerly dependent claim 6) The HBT of claim 33, wherein said sub-collector layer includes a functional portion aligned with said collector

5 layer, and an electrically insulating portion lateral to said collector layer and outside the area of said functional sub-collector portion to electrically isolate said HBT.

39. (Re-presented - formerly dependent claim 8) The HBT of claim 38, said insulating portion of the sub-collector layer including implanted ions and associated trapped conductors.

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40. (Re-presented - formerly independent claim 9) A double heterojunction bipolar transistor (DHBT), comprising;

an InP or InAlAs emitter,

an InGaAs base,

an InP collector,

an InP sub-collector, and

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10 an InGaAs contact layer between said collector and sub-collector which establishes, together with the sub-collector, a low resistance contact to the collector, said contact layer being thin enough to provide a substantially higher thermal conduction path between said collector and sub-collector than would bulk InGaAs.

41. (Re-presented - formerly dependent claim 10) The DHBT of claim 40, said contact layer having a thickness not greater than about 500 Angstroms.

42. (Re-presented - formerly dependent claim 11) The DHBT of claim 41, said contact layer having a thickness in the approximate range of 100-200 Angstroms.

43. (Re-presented - formerly dependent claim 12) The DHBT of claim 40, wherein said contact layer is doped N+.

44. (Re-presented - formerly dependent claim 13) The
5 DHBT of claim 40, wherein said contact layer and sub-
collector extend lateral to said collector.

45. (Re-presented - formerly dependent claim 14) The
10 DHBT of claim 44, further comprising a contact pad on
said contact layer lateral to said collector.

46. (Re-presented - formerly dependent claim 15) The
15 DHBT of claim 44, wherein at least a portion of said sub-
collector lateral to said collector is electrically
insulating to electrically isolate said HBT.

47. (Re-presented - formerly dependent claim 17) The
20 DHBT of claim 46, said insulating portion of the sub-
collector including implanted ions and associated trapped
conductors.
